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power not peculiar to the investigator, but in him reaching the greatest scope and freedom of action.

The investigator must not only be born, he must be permitted to grow up. He needs nourishing food, but equally needs to retain the power of securing and digesting it for himself. Twenty years is long enough to acquire or lose any habit, and it is not strange that after a youth consumed in our modern and efficient system of kindergartens, primary, grammar and high schools, colleges and universities, the graduate, and even the post-graduate, continues to expect somebody to tell him what to do next. In Germany it has been found necessary to offset the goose-liver-stuffing experience of the primary schools and gymnasias by a return to social barbarism in the university, but the self-assertion secured through rowdyism and immorality is no true substitute for the lost integrity of the intellect. The German's confidence in a highly developed governmental and educational machinery gives him little opportunity to perceive what is very apparent in our pioneer country where a large proportion of productive investigators have not suffered the disadvantage of too intensive education. Many are not even college men, and of those who are many come from small, poorly equipped institutions whose intellectual and social demands did not completely monopolize the time and interest of the period of intellectual growth. These men did not take their colleges too seriously, and did not cease to feel responsible for their own intellectual salvation. Modern philanthropy has reared palaces of learning in which all the supposed needs of the human mind are anticipated and supplied; the question now is whether an endowed education has not the same dangers as an endowed religion.

O. F. COOK.

WASHINGTON, September 22, 1902.

#### SHORTER ARTICLES.

##### PREPOTENCY IN POLYDACTYLOUS CATS.

It has long been one of the common notions in post-Darwinian speculations that the variations which produce new species have small beginnings and increase very gradually, variations sufficiently striking to be classed as sports

being considered practically incapable of modifying the species, since the number of individuals with the same abnormality would be relatively small, and the abnormal variation would be swamped by a few generations of crossing with normal, that is, average individuals. This notion seems to be based on the assumption that the characters of the offspring are the average of the characters of the two parents—that, in other words, an abnormality in either parent (the other being normal) is reduced one half in each succeeding generation.

The following observations, however, do not support this view. Not only do abnormal variations persist from generation to generation, but they even become more conspicuous, although one parent is always normal. The facts accord with Poulton's observations on a family of polydactylous cats (*Nature*, 1883 and 1887).

Some weeks ago my attention was called to three generations of cats in the possession of a Los Angeles family, many of the cats being furnished with an abnormal number of toes on both manus and pes. All are descended from a stray female of unknown pedigree, which possessed twenty-two toes, six (instead of five) on each manus, and five (instead of four) on each pes. This female, crossing with normal males, has produced several litters. In one litter there were five kittens, four of which were normal, the other having the normal number of five toes on each manus, but not the normal arrangement, the hallux being on a line with the others and equalling them in size. Each pes had six toes. The phalanges were apparently well formed, the same number to every toe.

Another litter contained several abnormal kittens (no accurate account was kept of the ratio of normal to abnormal), one of which survives and has been examined by me, as have all the other abnormal cats to be mentioned. It has six toes on the right manus, seven on the left manus, and the normal number, four, on each pes. Such a condition may be represented in the following manner:

$$\begin{array}{r|l} 7 & 6 \\ \hline 4 & 4 \end{array}$$

This cat is a female and has borne three litters with normal fathers. Fifty per cent., as the owners remembered, were abnormal in one litter. The sole survivor has twenty-four toes, six on each manus and pes, all practically equivalent. In another litter more than fifty per cent. were abnormal; the sole survivor, a male, has the digit formula of

$$\frac{7}{6} \frac{6}{6}$$

with a total of twenty-five toes. In the third litter there are five kittens. Three are abnormal, with the following formulæ:

$$\frac{6}{5} \frac{6}{5}, \quad \frac{6}{4} \frac{6}{4}, \quad \frac{7}{5} \frac{7}{5}.$$

The last formula represents the number of digits when the kitten was a few days old. The first (inside) digit on one pes has now totally disappeared, and the corresponding one on the other pes is fast shriveling away; so that the normal number on each pes is being secondarily established by a resorption of No. 1, the toe which is normally absent on the pes and reduced on the manus.

In each of the four instances in which seven toes appear on one foot they are arranged in two groups. Toes Nos. 7, 6, 5, 4 (7 being the outermost toe) resemble the main four toes of the normal manus (*i. e.*, 5, 4, 3, 2). Of the three constituting the second group No. 2 is larger than any of the other six toes. Nos. 1 and 3 are of about equal size and smaller than any of the other five. Nos. 1, 2 and 3, taken together, seem to form a second (supernumerary) foot. It is interesting that seven toes occur only on a manus, which had normally more toes than the pes. The fact that the fifth toe degenerated in one case on the inside of the pes indicates that the supernumerary toes are added on the inside of the foot. This probably does not hold when there are two supernumeraries on the manus (seven in all), where, as Poulton held, the innermost toe may represent the hallux, or the supernumeraries may be interpreted as Freeland Howe, Jr., has recently (*Am. Nat.*, July, 1902) interpreted them in six-toed feet. According to this interpretation the outermost three toes are comparable to digits 3, 4, 5, of the normal

pes. None of the other three individually represent Nos. 1 or 2, but collectively they replace No. 1 plus No. 2. This seems to me the more probable view in the present instance.

A review of the above facts shows the marked prepotency of the sport. The grandmother (generation I.) had

$$\frac{6}{5} \frac{6}{5}$$

or 22 toes. In generation II., one litter contained but one abnormal kitten among five (twenty per cent.), with a total of 22 toes. The other litter contained several abnormal ones, the sole survivor possessing seven toes on one manus, though with a total of but 21. From this cat have arisen the three litters of generation III., in which one has 25 toes (one manus having 7), two have 24 (one of these having 7 on each manus), and all three litters possessed not less than fifty per cent. of abnormal individuals, the last having sixty per cent. It is clear that the total number as well as the number on each manus and pes is increasing from generation to generation.

There seems to be a no less remarkable prepotency of sex. The male cat with 25 toes, when crossed with normal females, seems to have had no influence on the number of toes in the offspring, so far as information could be obtained. This result is not in harmony with Poulton's observations, however, and may not be borne out by further information.

I have obtained several of these cats for breeding and future study.

HARRY BEAL TORREY.

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BERKELEY, CAL., Sept. 6, 1902.

MAGNETIC WORK OF THE UNITED STATES COAST AND  
GEODETIC SURVEY PLANNED FOR JULY 1,  
1902, TO JUNE 30, 1903.

(a) *Land Magnetic Survey Work.*—The determination of the three magnetic elements at four hundred to five hundred stations distributed principally in Virginia, New Jersey, Pennsylvania, Ohio, Michigan, Kansas, Nebraska, Texas, Arkansas and Florida.

(b) *Magnetic Observatory Work.*—The continuous operation of the four magnetic observ-